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Sugiyama et al.

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(54) **SEAT DEVICE**

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B60N 2/90 (2018.01)
(Continued)

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CPC ***A47C 7/62*** (2013.01); ***A61B 5/1123*** (2013.01); ***A61B 5/18*** (2013.01); ***A61B 5/4806*** (2013.01);
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(58) **Field of Classification Search**
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(Continued)

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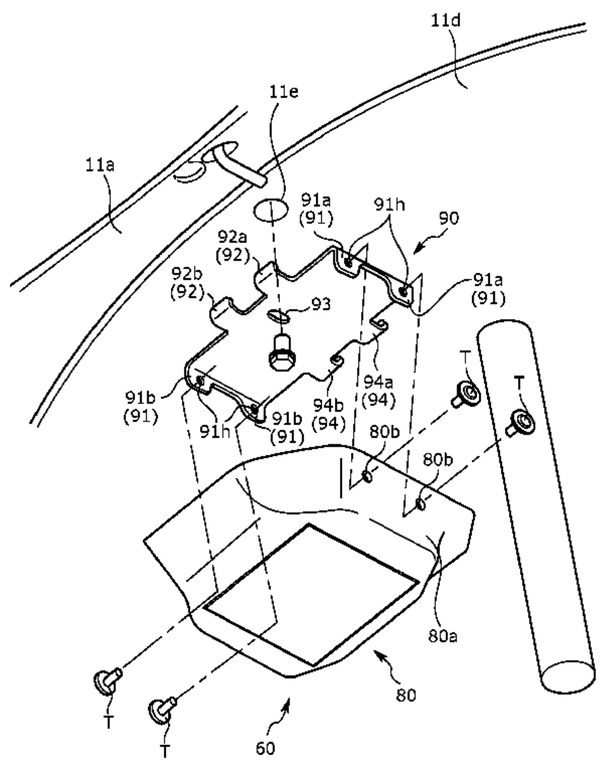
(57) **ABSTRACT**

In a configuration in which a holder holding a controller is mounted on a seat part with a plate-shaped member, the exposure of the mounting part of the plate-shaped member on which the holder is mounted is eliminated. A seat device includes a pressure sensor measuring a value relating to the seated person's state a vibration imparting device performing a vibration imparting operation, an ECU controlling the vibration imparting device corresponding to the measurement result of the pressure sensor, a holder holding the ECU, and a mounting bracket fixed to a lower frame such that the holder is mounted on the lower frame of a seat part. The mounting bracket includes a mounting projection on which a side wall of the holder is mounted in a predetermined mounting direction. When the side wall is mounted on the mounting projection, the mounting projection is covered with the side wall.

6 Claims, 14 Drawing Sheets



(51) **Int. Cl.**

A61B 5/11	(2006.01)
A61B 5/18	(2006.01)
A61B 5/00	(2006.01)
A61M 21/00	(2006.01)

(52) **U.S. Cl.**
CPC ***A61M 21/00*** (2013.01); ***B60N 2/90*** (2018.02); *A61M 2021/0022* (2013.01); *A61M 2205/10* (2013.01); *A61M 2205/3331* (2013.01); *A61M 2209/082* (2013.01); *B60N 2002/981* (2018.02)

(58) **Field of Classification Search**
CPC .. A47C 7/44; A47C 7/441; A47C 7/62; B60N 2/002; B60N 2/976
See application file for complete search history.

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FIG. 1

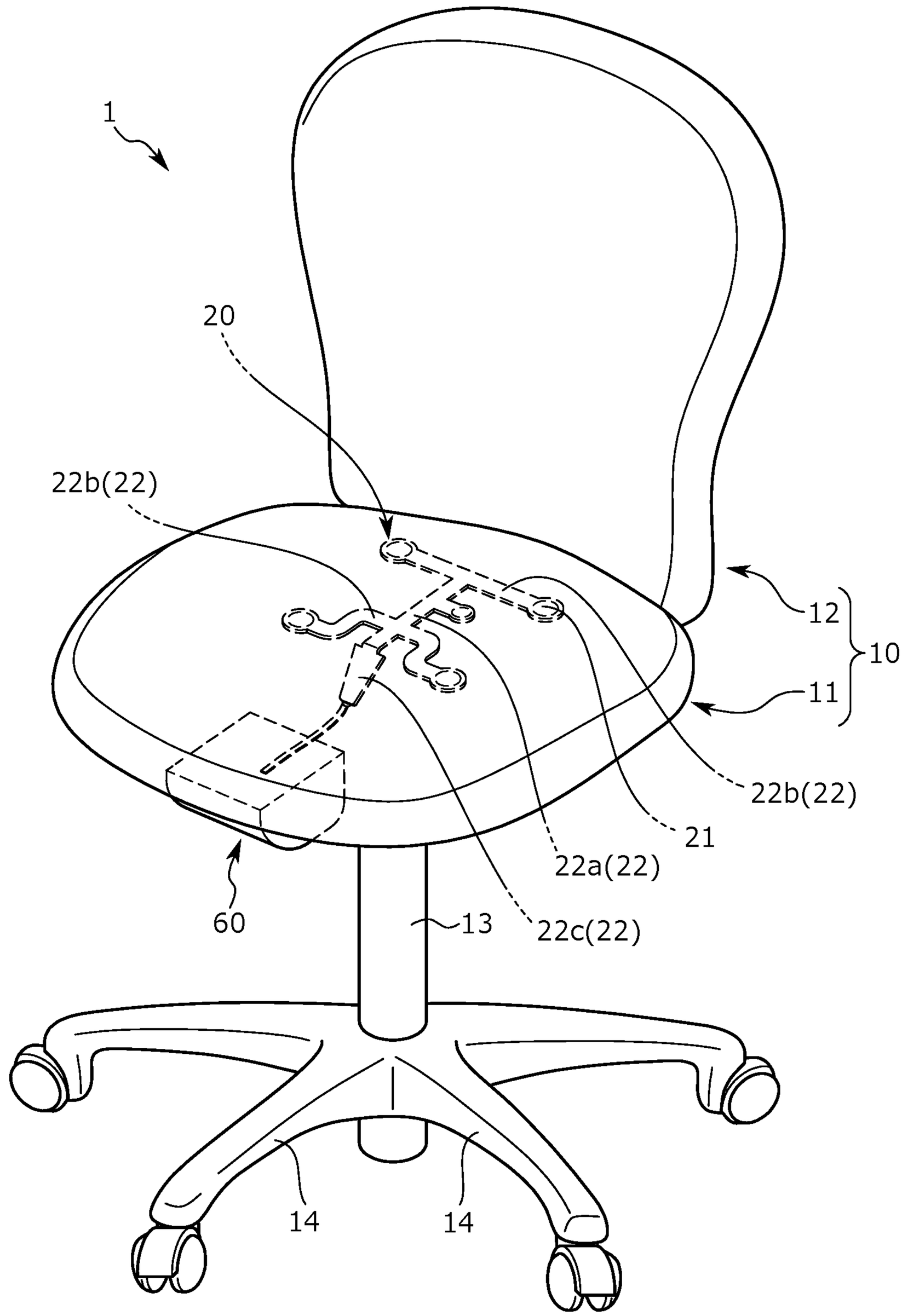


FIG. 2A

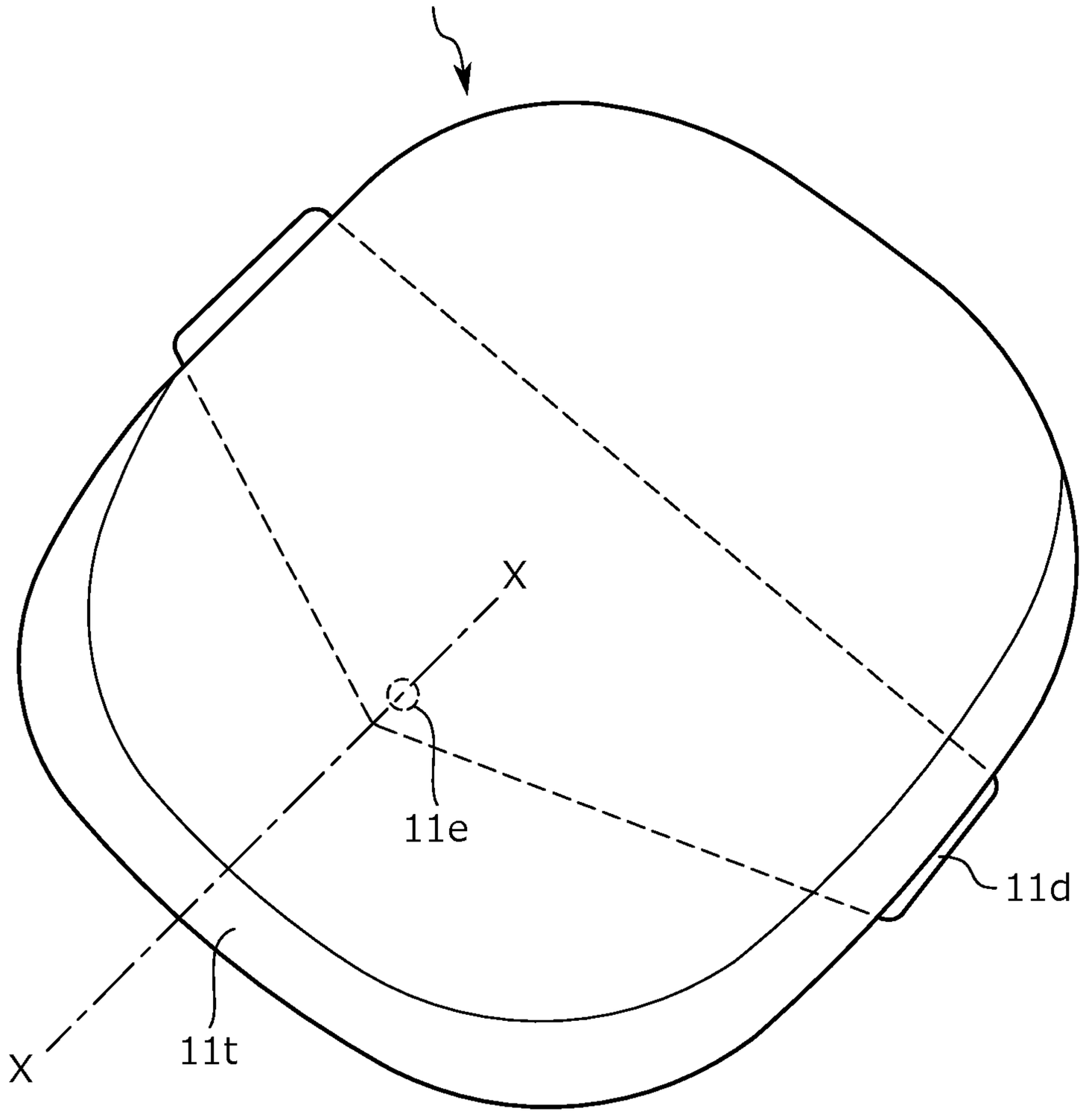


FIG. 2B

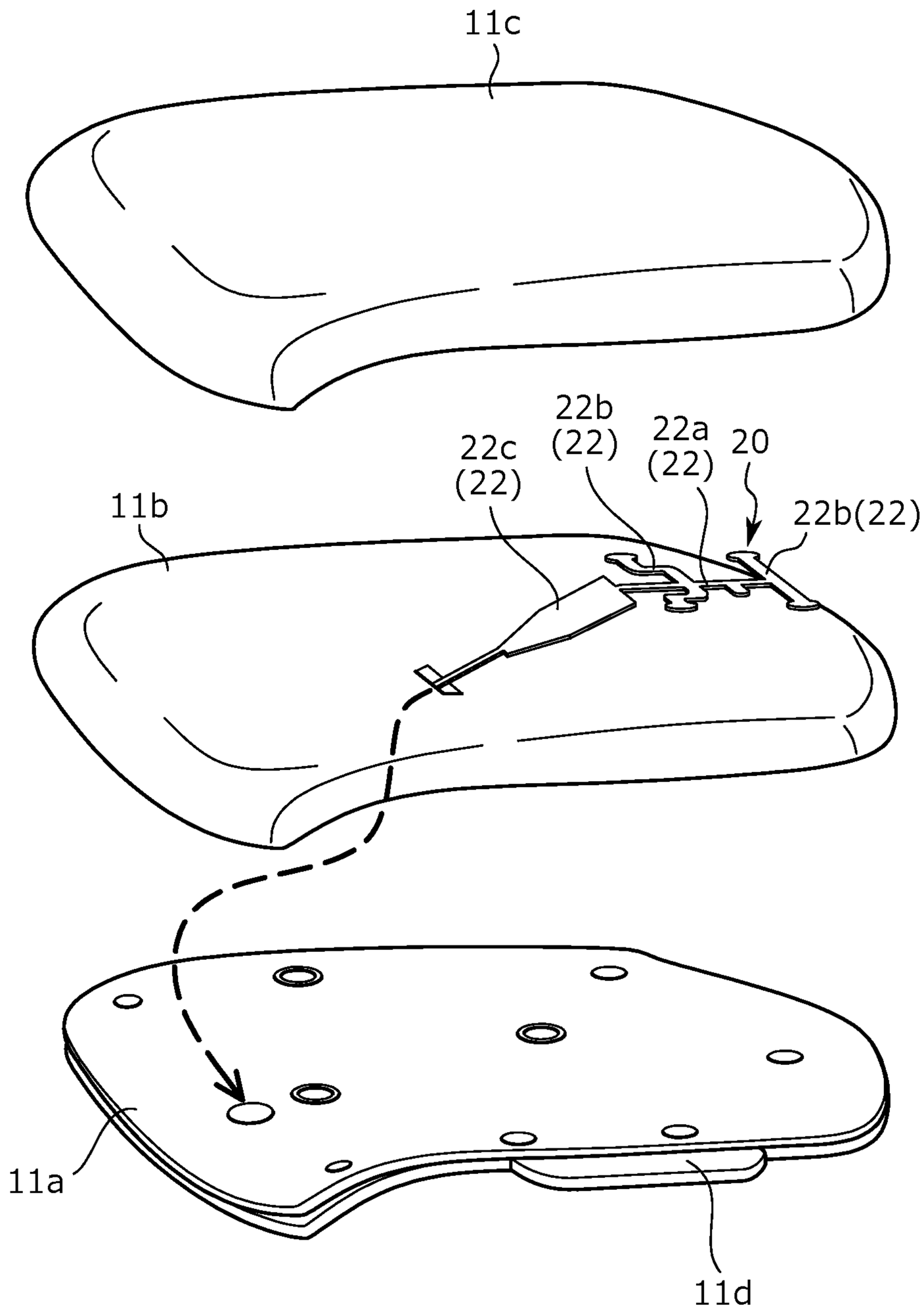


FIG. 3

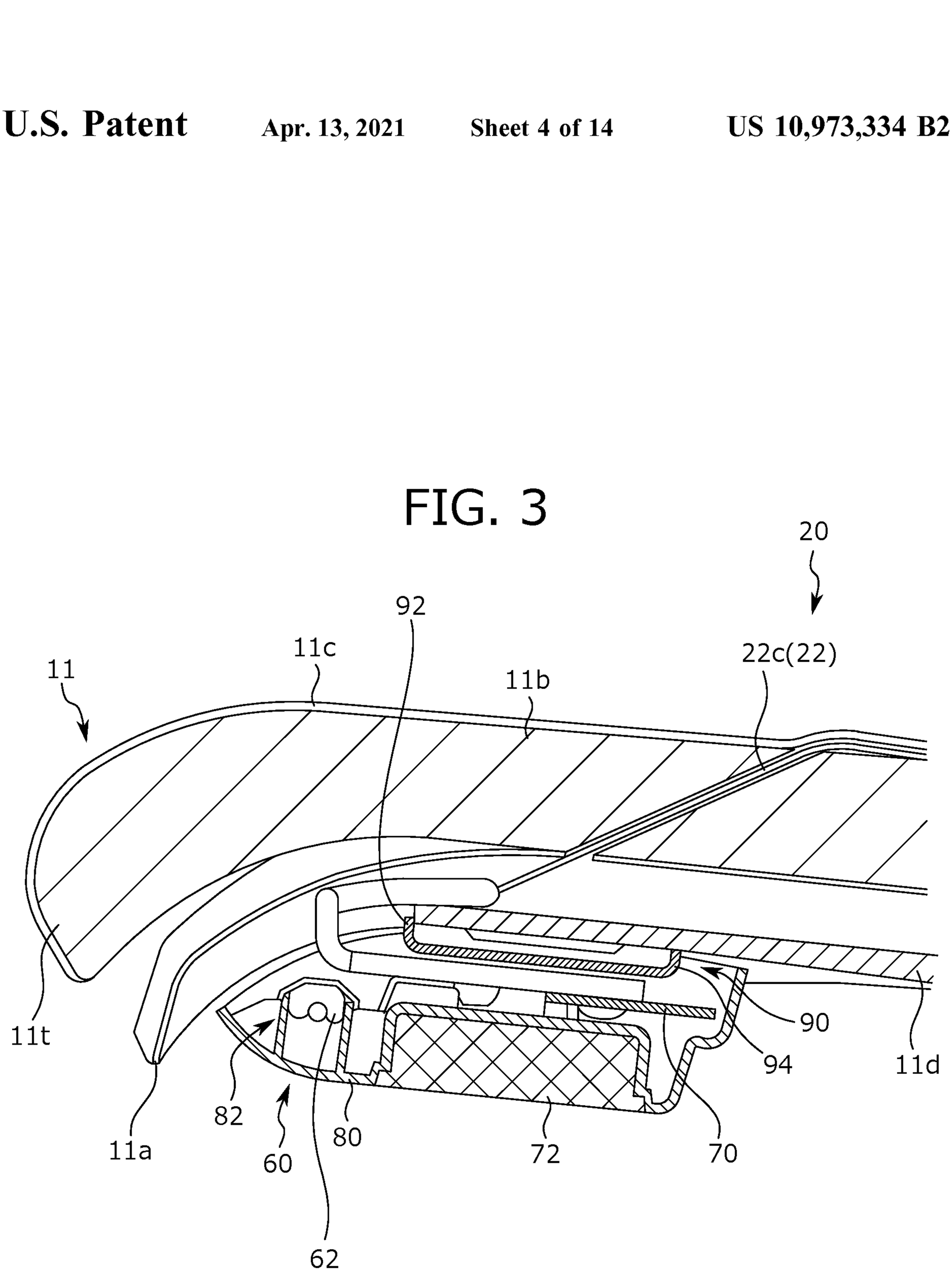


FIG. 4

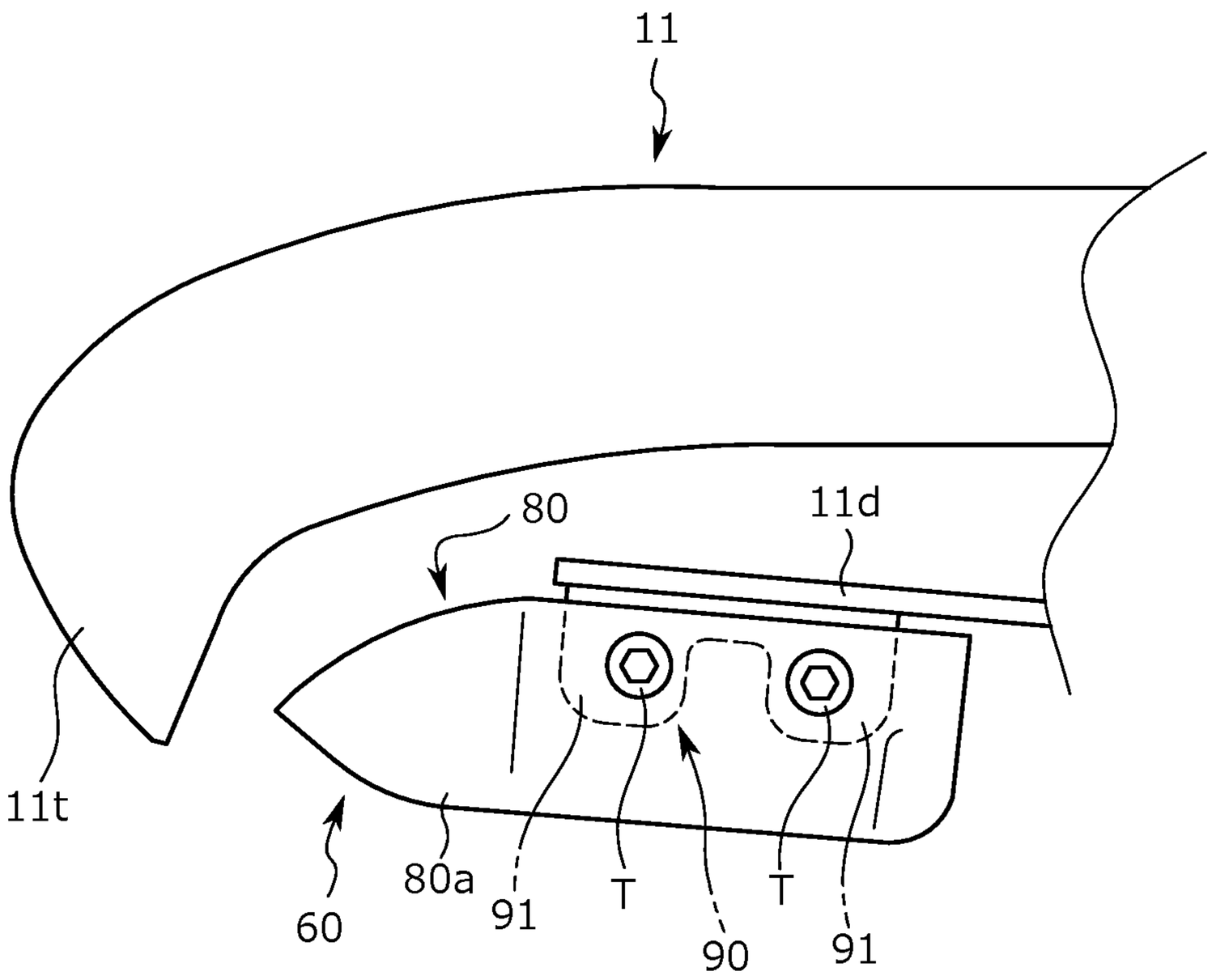


FIG. 5

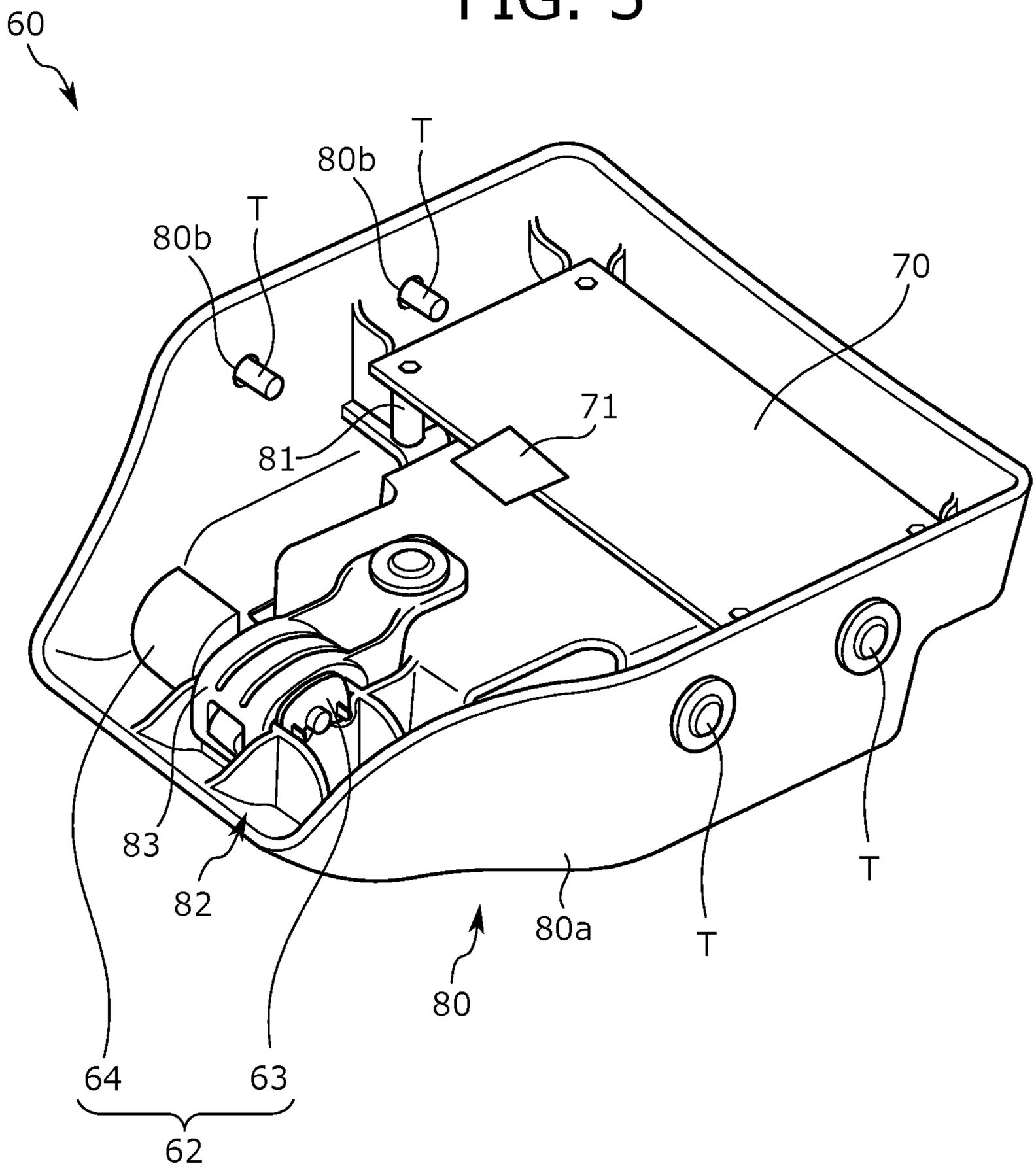


FIG. 6

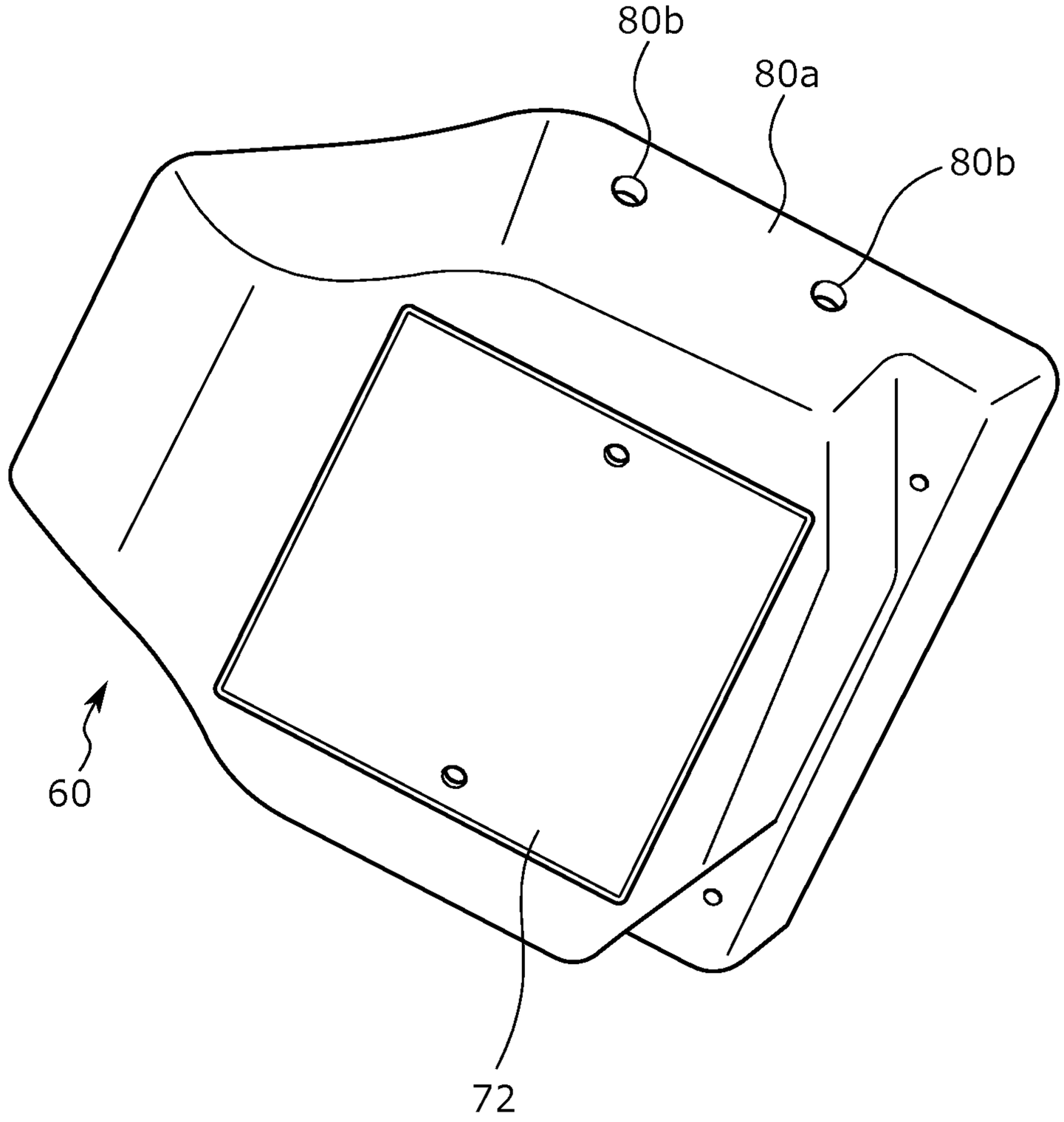


FIG. 7

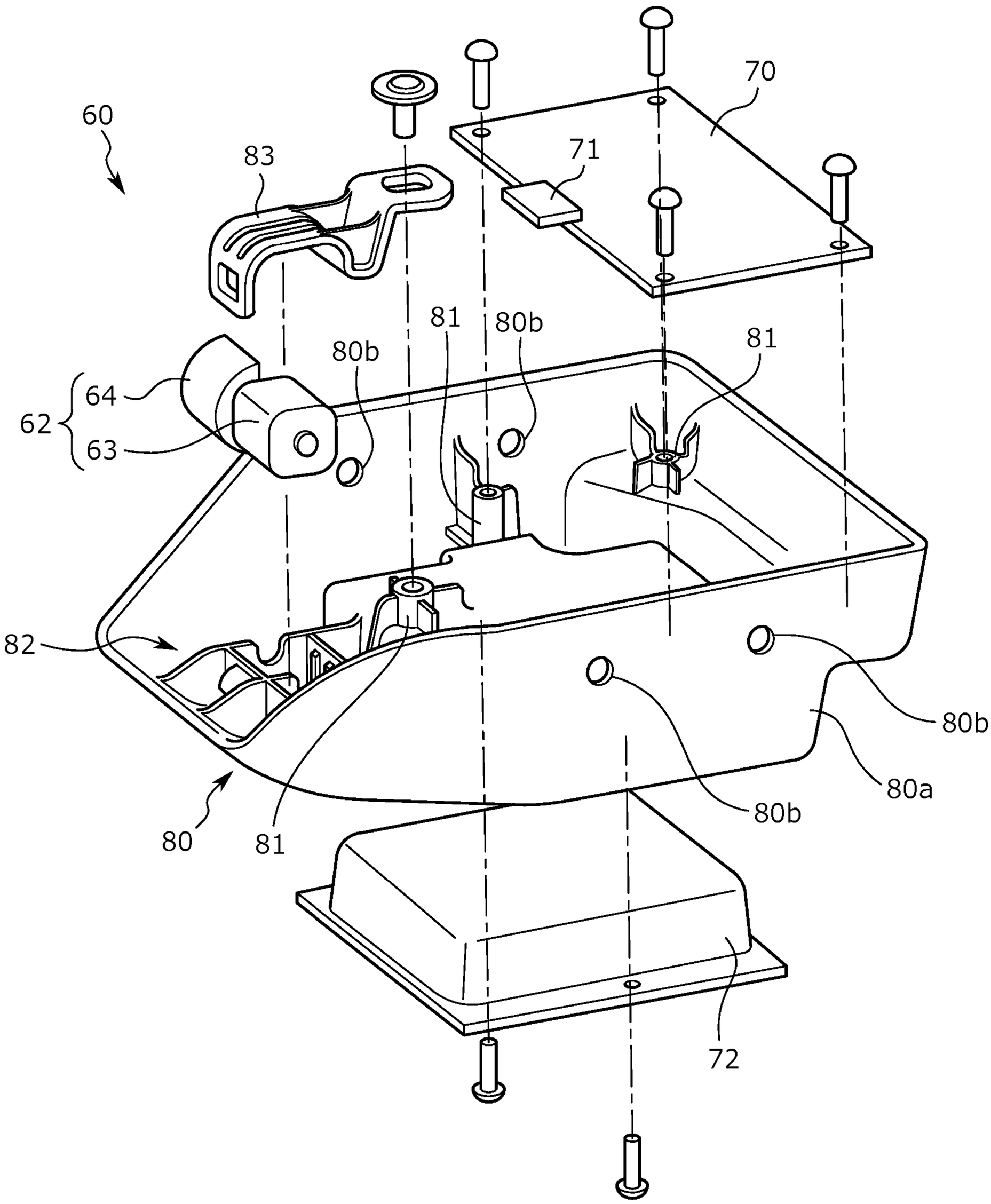
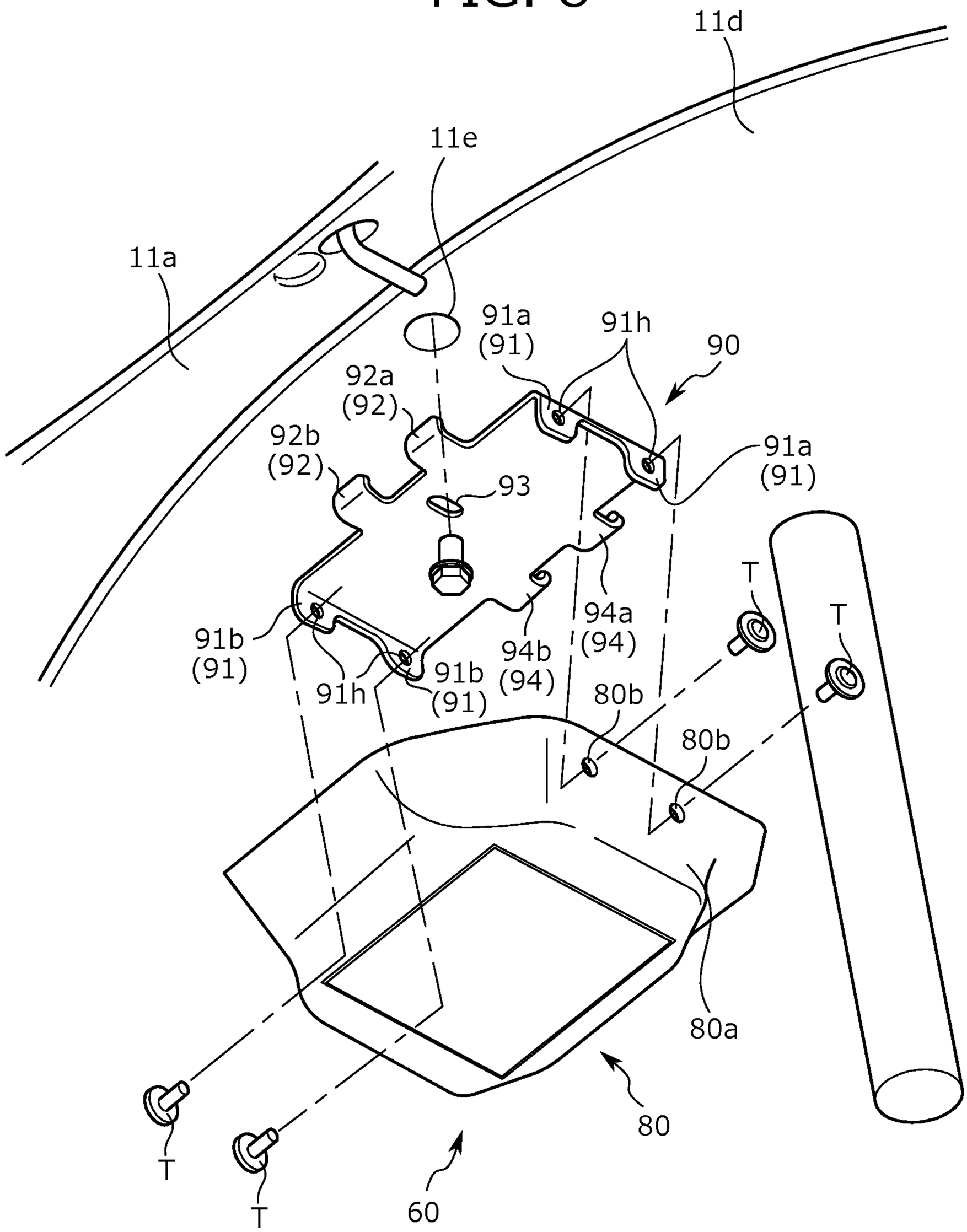


FIG. 8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91h
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92b
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91b
(91)
91h
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80b
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FIG. 9A

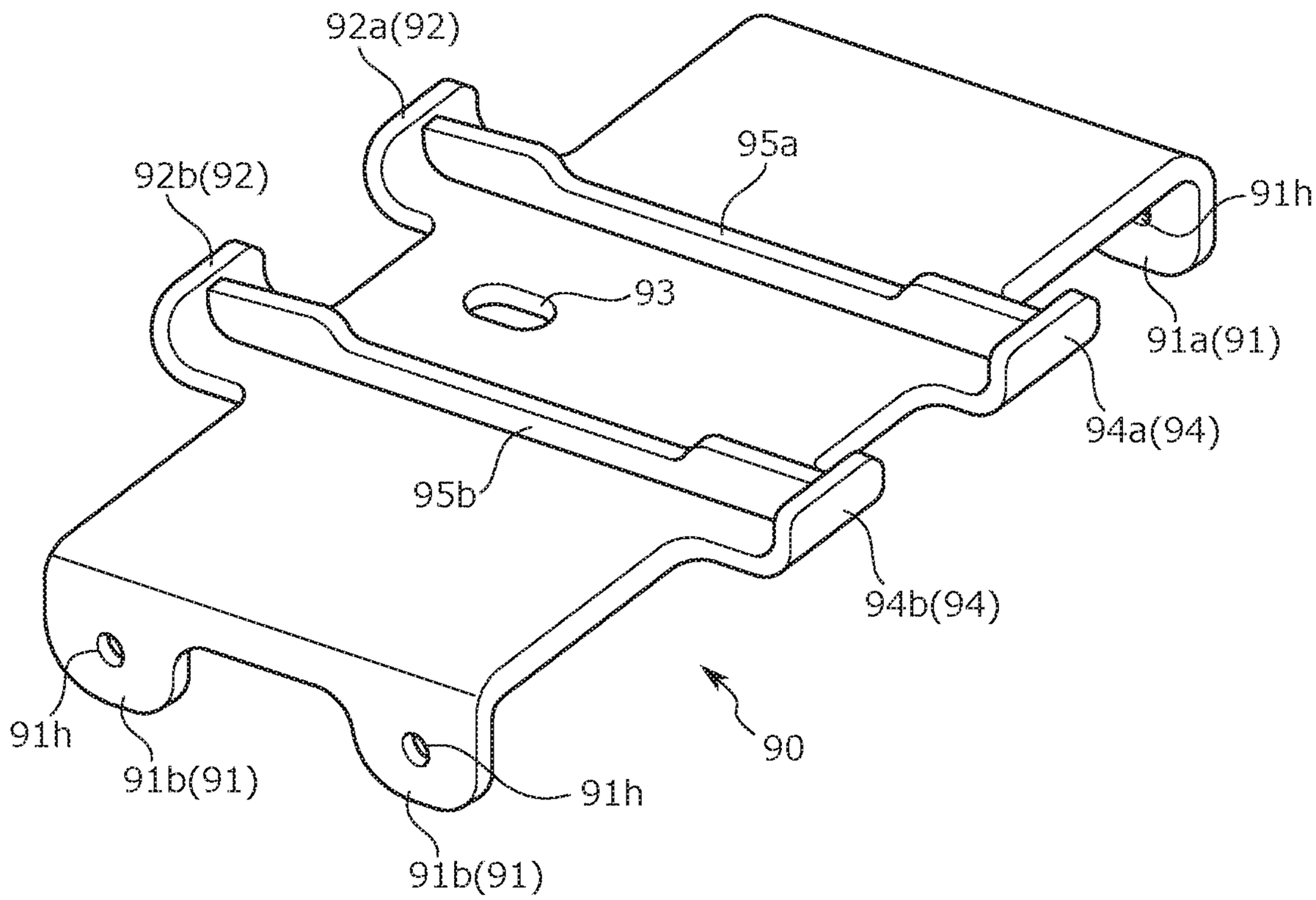
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FIG. 9B

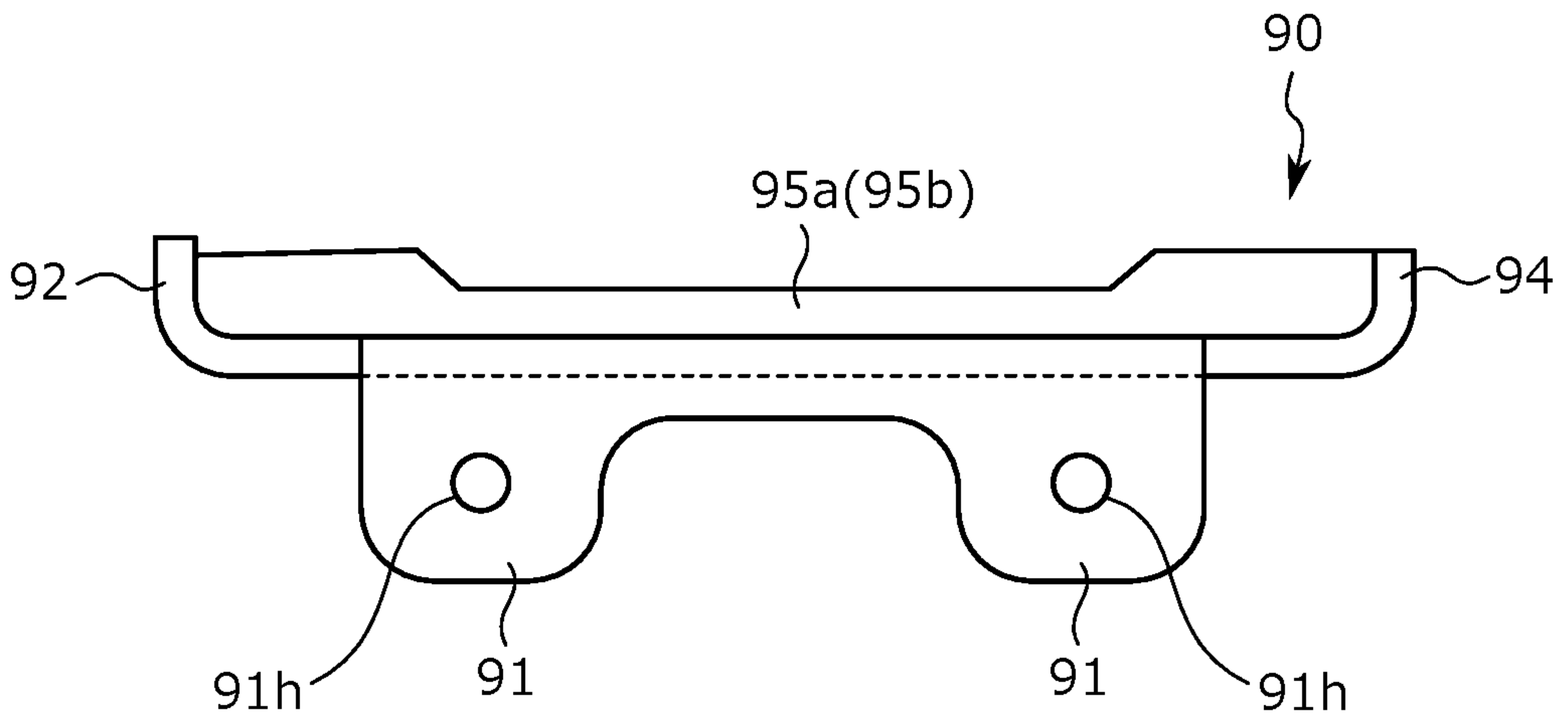


FIG. 10

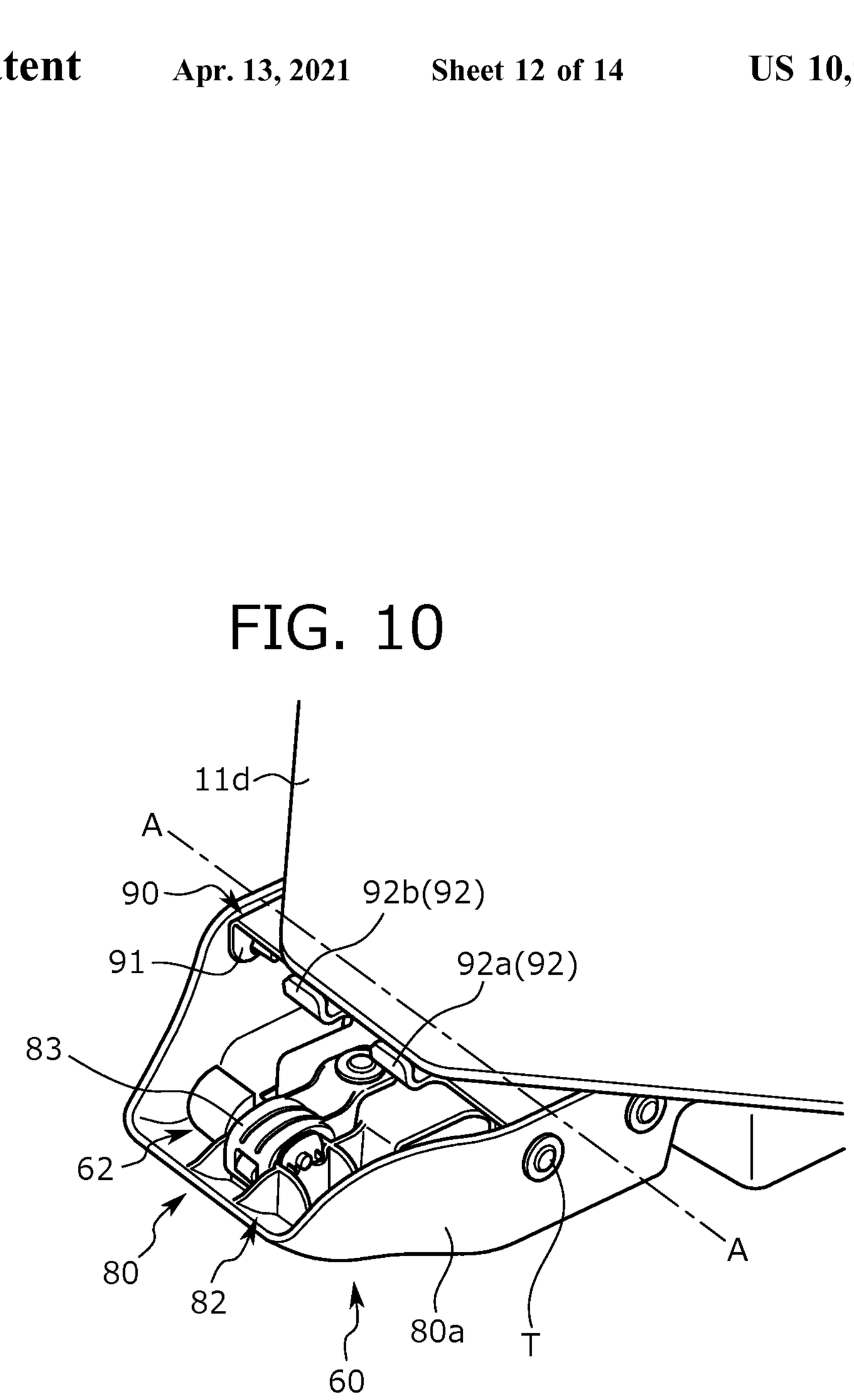


FIG. 11

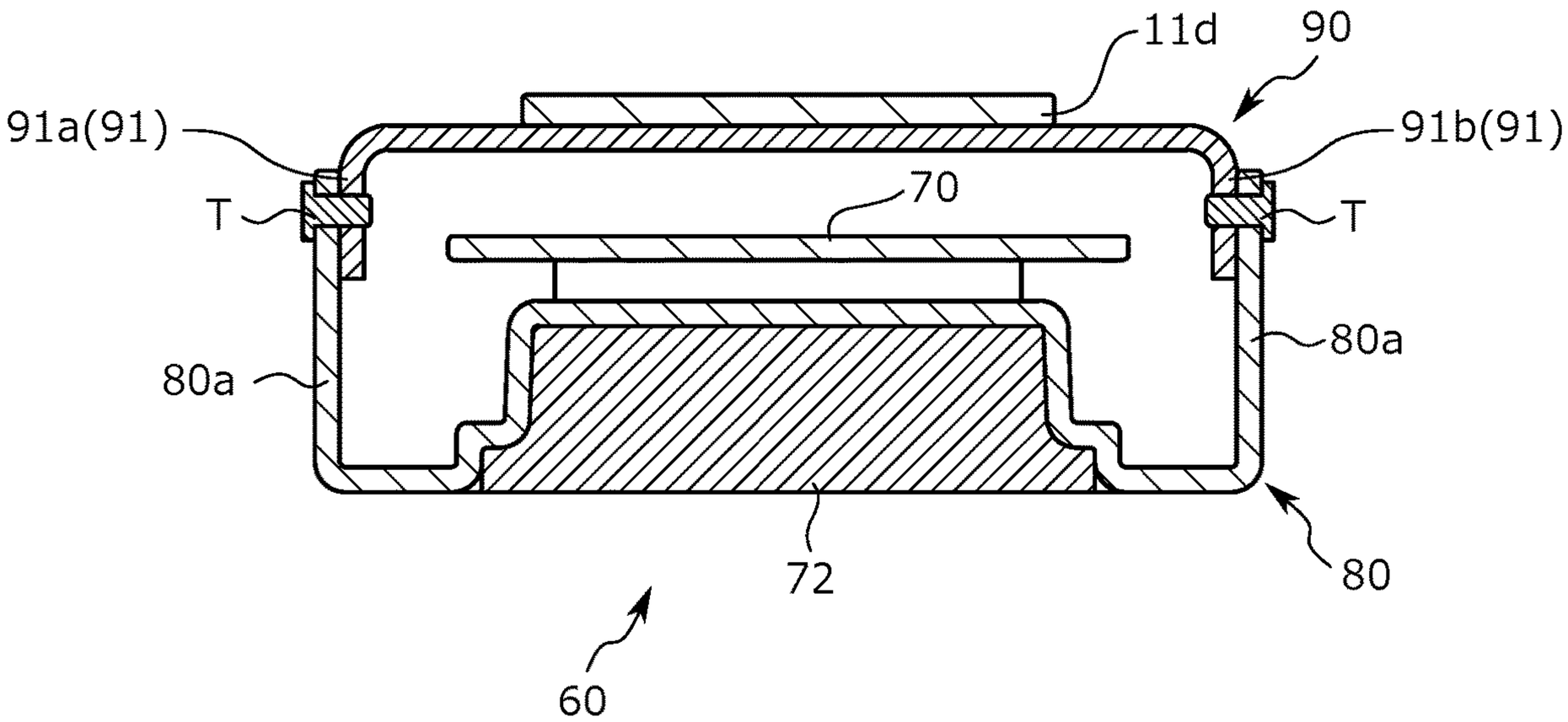
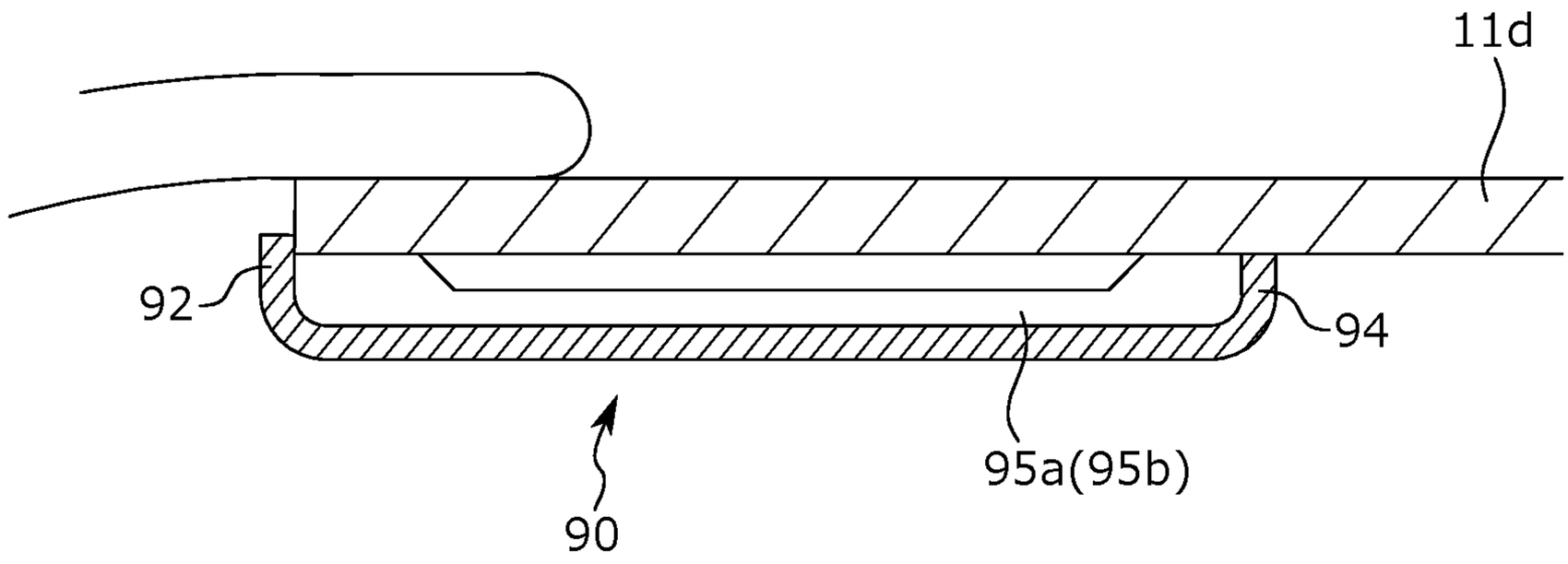


FIG. 12



SEAT DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a National Entry application of PCT Application Serial Number PCT/JP2017/035151, filed. Sep. 28, 2017. Further, this application claims priority from Japanese Patent Application Serial Number JP 2016-225357, filed Nov. 18, 2016, the entire contents of which are hereby incorporated by reference into this application.

TECHNICAL FIELD

The present invention relates to a seat device, and particularly to a seat device having a seat part, a sensor, a moving device, and a control mechanism.

BACKGROUND ART

Among seat devices having a chair or a seat part, such as a seat, there are some seat devices mounted with a sensor that senses the state of a seated person seated on the seat part (e.g. the wakefulness level). There are also seat devices including a device (a moving device) that performs a predetermined operation suitable for the state of a seated person. In such seat devices, a control mechanism is usually provided. The control mechanism controls the moving device corresponding to the measurement result of the above-described sensor.

In the seat device including the above-described control mechanism, the control mechanism is sometimes mounted at a predetermined position in the seat part. In specific description taking an example, in a chair of Patent Literature 1, an ECU (Electrical Control Unit) that is a control mechanism is held on a holder. The chair described in Patent Literature 1 is configured in which the holder holding the ECU is screwed on the under surface of the seat part and hence the ECU is mounted on the seat part through the holder.

CITATION LIST

Patent Literature

PATENT LITERATURE 1: JP 2016-185256

SUMMARY OF INVENTION

Technical Problem

As a method of mounting a control mechanism on a seat part through a holder, a method can be thought with which a plate-shaped member, such as a bracket, is fixed to a seat part and a holder holding the control mechanism is mounted on a predetermined part (a mounting part) of the plate-shaped member. In the case in which such a configuration is adopted, from the viewpoint of ensuring the quality of the seat device, the importance is to minimize the exposure of the mounting part of the plate-shaped member on which the holder is mounted.

In the case in which the control mechanism is mounted on the seat part using the above-described plate-shaped member, desirably, the holder holding the control mechanism is easily mounted on the plate-shaped member.

Therefore, the present invention is made in view of the problems. An object is to provide a seat device that can eliminate the exposure of the mounting part of a plate-shaped member on which a holder is mounted in the configuration in which the holder holding a control mechanism is mounted on a seat part with the plate-shaped member.

Another object of the present invention is to more easily mount a holder holding a control mechanism in mounting the holder on a seat part with a plate-shaped member.

Solution to Problem

The problems are solved by a seat device according to the present invention, the seat device including a seat part on which a seated person is seated, a sensor configured to measure a measurement value relating to a state of the seated person seated on the seat part, a moving device having a moving part, the moving device being configured to perform an operation of moving the moving part, a control mechanism configured to control the operation of the moving device corresponding to a measurement result of the sensor, a holder holding the control mechanism, and a plate-shaped member fixed to the seat part such that the holder is mounted on the seat part. The plate-shaped member includes a mounting part on which a mounted part of the holder is mounted in a predetermined mounting direction. In a state in which the mounted part is mounted on the mounting part, the mounting part is covered with the mounted part in the mounting direction.

In the seat device according to the present invention thus configured, in mounting the holder holding the control mechanism on the seat part using the plate-shaped member, the mounted part of the holder is mounted on the mounting part of the plate-shaped member in a predetermined mounting direction. In the state in which the mounted part is mounted on the mounting part, the mounting part is covered with the mounted part in the mounting direction. That is, in the state in which the control mechanism is mounted on the seat part, the exposure of the mounting part of the plate-shaped member is eliminated by the holder (strictly speaking, the mounted part).

In the above-described seat device, the mounting part may have a first mounting part and a second mounting part formed at positions apart from each other in the mounting direction. The plate-shaped member may have a plate-shaped member fixing part formed such that the plate-shaped member is fixed to the seat part. The plate-shaped member fixing part may be formed between the first mounting part and the second mounting part in the mounting direction.

In the above-described configuration, the plate-shaped member fixing part is formed between the first mounting part and the second mounting part of the plate-shaped member. In other words, the first mounting part and the second mounting part are provided on the outer side of the plate-shaped member fixing part in the mounting direction. With such a configuration, the situations are easily avoided in which problems are caused on the work that mounts the mounted part of the holder on the mounting parts due to fixing the plate-shaped member to the seat part at the plate-shaped member fixing part.

In the above-described seat device, a lower portion of the seat part may have a frame. The plate-shaped member may have an engaging part engaged with an edge portion of the frame with the plate-shaped member fixed to the seat part. The engaging part may be engaged with the edge portion of the frame in an engaging direction intersecting with the mounting direction.

In the above-described configuration, the plate-shaped member has the engaging part, and the above-described engaging part is engaged with the edge portion of the frame of the seat part with the plate-shaped member fixed to the seat part. With such a configuration, the plate-shaped member can be fixed to the frame while the attitude of the plate-shaped member is stabilized.

In the above-described seat device, the engaging part may have a first engaging part and a second engaging part formed at positions apart from each other in the mounting direction. The plate-shaped member may have a contact part in contact with an under surface of the frame with the plate-shaped member fixed to the seat part. The contact part may have a first contact part and a second contact part formed at positions apart from each other in the mounting direction. A first joining rib extending so as to join the first engaging part to the first contact part and a second joining rib extending so as to join the second engaging part to the second contact part may be provided on the plate-shaped member.

In the above-described configuration, the engaging part of the plate-shaped member has the first engaging part and the second engaging part. The plate-shaped member has the first contact part and the second contact part as the contact parts that are in contact with the under surface of the frame with the plate-shaped member fixed to the seat part. The first joining rib joining the first engaging part to the first contact part and the second joining rib joining the second engaging part to the second contact part are provided on the plate-shaped member. With such a configuration, the rigidity of the engaging parts and the contact parts can be improved. Thus, the engaging parts appropriately keep the engaging state with the edge portion of the frame of the seat part. The contact parts appropriately keep the state in contact with the under surface of the frame.

In the above-described seat device, a front end portion of the seat part may have a portion overhanging downward. In the front end portion of the seat part, the portion overhanging downward may be located on a front side of a front end of the holder, and the portion overhanging downward may cover at least apart of the front end of the holder in a front to back direction of the seat part.

In the above-described configuration, the front end portion of the seat part has the portion overhanging downward, and the portion covers a part of the front end of the holder. That is, according to the above-described configuration, the front end of the holder can be protected using a part of the front end portion of the seat part.

In the above-described seat device, the mounting direction may be a direction along a front to back direction of the seat part or along a width direction of the seat part. The mounting part may protrude along a vertical direction of the seat part with the plate-shaped member fixed to the seat part.

In the above-described configuration, in the plate-shaped member, the mounting part protrudes along the vertical direction of the seat part. In mounting the mounted part of the holder on the mounting part of the plate-shaped member, the mounted part of the holder is mounted along the front to back direction of the seat part or along the width direction of the seat part. With such a configuration, the mounted part can be more easily mounted compared with the configuration in which the mounted part is mounted on the mounting part along the vertical direction of the seat part.

In the above-described seat device, a battery configured to supply electric power to the moving device may be included. The holder may hold the moving device and the battery together with the control mechanism.

In the above-described configuration, the holder holding the control mechanism also serves as a member holding the moving device and the battery. With such a configuration, the number of components (the number of the holders) can be made much smaller compared with the configuration in which the holders are provided individually to the control mechanism, the moving device, and the battery.

Advantageous Effects of Invention

According to the seat device of the present invention, in the state in which the holder holding the control mechanism is mounted on the seat part using the plate-shaped member, the exposure of the mounting part of the plate-shaped member can be eliminated by the holder.

According to the seat device of the present invention, the situations are easily avoided in which problems are caused on the work that mounts the mounted part of the holder on the mounting part due to fixing the plate-shaped member to the seat part at the plate-shaped member fixing part.

According to the seat device of the present invention, the plate-shaped member can be fixed to the frame while the attitude of the plate-shaped member is stabilized.

According to the seat device of the present invention, the rigidity of the engaging part and the contact part can be improved. Thus, the engaging part appropriately keeps the engaging state with the edge portion of the frame of the seat part, and the contact part appropriately keeps the contact state with the under surface of the frame.

According to the seat device of the present invention, the front end of the holder can be protected using a part of the front end portion of the seat part.

According to the seat device of the present invention, in mounting the mounted part of the holder on the mounting part of the plate-shaped member, the mounted part is mounted along the front to back direction of the seat part or along the width direction of the seat part. Thus, the mounted part can be more easily mounted compared with the configuration in which the mounted part is mounted on the mounting part along the vertical direction of the seat part.

In the seat device according to the present invention, the holder holding the control mechanism also serves as a member holding the moving device and the battery. Thus, the number of components (the number of the holders) is made much smaller compared with the configuration in which the holders are provided individually to the control mechanism, the moving device, and the battery.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a perspective view showing the outside of a seat device according to an embodiment of the present invention.

FIG. **2**A is an outside view of a seat part.

FIG. **2**B is an illustration of the configuration of the seat part.

FIG. **3** is a side cross-sectional view showing positions at which devices around the seat part are disposed.

FIG. **4** is a view of the front end portion of the seat part when viewed from the lateral side.

FIG. **5** is a view of a holder holding a control mechanism when viewed from above.

FIG. **6** is a view of the holder holding a battery when viewed from below.

FIG. **7** is a view relating to a method of holding the control mechanism, a moving device, and the battery on the holder.

FIG. **8** is a view relating to a method of mounting the holder on the frame of the seat part using a plate-shaped member.

FIG. **9**A is a perspective view of the plate-shaped member.

FIG. **9**B is a front view of the plate-shaped member.

FIG. **10** is a view of the holder mounted on the frame of the seat part when viewed from above.

FIG. **11** is a cross-sectional view taken along line A-A in FIG. **10**.

FIG. **12** is an enlarged view of the area around the plate-shaped member of FIG. **3**.

DESCRIPTION OF EMBODIMENTS

In the following, a seat device according to an embodiment (the present embodiment) of the present invention will be described. The seat device according to the embodiment is configured in which a sensor that measures measurement values changing corresponding to the wakefulness level of a seated person, a device that operates corresponding to the measurement result of the sensor and equipment relating to the device are installed on a typical chair or a seat. According to the seat device of the embodiment, when the wakefulness level of the seated person is lowered, a change in the wakefulness level is sensed, the above-described device is operated corresponding to the wakefulness level, and then an appropriate stimulus is imparted to the seated person. Thus, the wakefulness level of the seated person can be improved (restored).

In the following, a seat device configured in which the above-described sensor or device, for example, is installed on a typical office chair is taken as an example, and the configuration of the seat device will be described. Note that the embodiment described below is merely an example. Instead of the office chair, a seat device may be configured using conveyance seats used for conveyances, such as vehicles, ships, or air crafts, or using seats placed in buildings, such as facilities.

Note that in the following description, the positions, attitudes, and orientations of the component members of the seat device are the positions, attitudes, and orientations where the seat device is in a normal state (specifically, the seat surface is on the top side and the lower ends of legs are in contact with the floor surface) unless otherwise specified.

As shown in FIG. **1**, the seat device according to the embodiment (in the following, a seat device **1**) has a chair main body **10** and a respiration sensor unit **20**. First, referring to FIGS. **1** to **4**, the configurations of the chair main body **10** and the respiration sensor unit **20** will be described. FIG. **1** is a perspective view showing the outside of the seat device **1** according to the embodiment. FIG. **2**A is an outside view of a seat part **11** in the chair main body **10**. FIG. **2**B is an illustration of the configuration of the seat part **11**, which is an explored view of the components of the seat part **11**. FIG. **3** is a side cross-sectional view showing the position at which the respiration sensor unit **20** is disposed in the seat part **11**, which is a view showing a cross section along line X-X in FIG. **2**A. FIG. **4** is a view of the front end portion of the seat part **11** when viewed from the lateral side.

The chair main body **10** is the part of the seat device **1** except the respiration sensor unit **20** and an awakening unit **60**, described later, having a structure similar to a publicly known office chair. That is, as shown in FIG. **1**, the chair main body **10** has the seat part **11** on which a seated person is seated and a backrest portion **12** on which a seated person's back reclines. The seat part **11** has the outside shown in FIG. **2**A, and supports seated person's buttocks on the top surface. The seat part **11** is supported by a support post **13** disposed at the position below the seat part **11**. At the lower portion of the support post **13**, leg parts **14** are provided at every 60 degrees or 90 degrees about the support post **13**. At the tip end portions of the leg parts **14**, a caster is mounted. In the state in which the casters are in contact with the floor surface, the seated person sits on the top surface (i.e., the seat surface) of the seat part **11**.

In the description of the configuration of the seat part **11** with reference to FIG. **2**B, the seat part **11** is configured in which a pad material **11***b* is placed on a resin frame **11***a* and this pad material **11***b* is covered with a skin material **11***c*. The resin frame **11***a* has a size enough to support the pad material **11***b* from below.

In the lower portion of the resin frame **11***a*, a lower frame **11***d* is disposed. The lower frame **11***d* is a resin frame that constitutes the lower portion of the seat part **11**, supporting the resin frame **11***a* from below. The lower frame **11***d* is shaped in an oblong pentagonal shape (more strictly speaking, a home base shape) wide in the width direction of the seat part **11** having a nearly triangular front end portion.

As shown in FIG. **3**, the front end portions of the resin frame **11***a*, the pad material **11***b*, and the skin material **11***c* are curved downward as the front end portions come close to the front end. In other words, the front end portion of the seat part **11** has a portion overhanging downward (in the following, an overhang portion **11***t*).

The respiration sensor unit **20** is a device that measures measurement values relating to the state of the seated person seated on the seat part **11**, and more specifically to measurement values changing corresponding to the wakefulness level (sleepiness) of the seated person. As shown in FIG. **1**, the respiration sensor unit **20** has pressure sensors **21**, conductor wires (not shown) forming the transmission lines of signals outputted from the pressure sensors **21**, and a conductor wire holding film **22** to which the conductor wires are adhered.

The pressure sensor **21** is formed of a publicly known pressure sensor. A plurality of pressure sensors **21** is disposed in the seat part **11**, and the pressure sensor **21** measures a pressure (a seating pressure) applied to the seat surface when the seated person is seated on the seat part **11**. Here, the seating pressure is a value that periodically changes corresponding to the physiological activities of the seated person, specifically to respiration, and is a measurement value measured at the pressure sensor **21**. The seating pressures measured at the pressure sensors **21** change reflecting the wakefulness level of the seated person. In other words, the pressure sensors **21** are sensors that measure the seating pressures changing corresponding to the wakefulness level of the seated person. The pressure sensors **21** output signals corresponding to measurement results.

Note that in the embodiment, the pressure sensors **21** are disposed in the seat part **11** being sandwiched between the pad material **11***b* and the skin material **11***c* near the location where the seated person's buttocks are placed. The pressure sensors **21** are disposed being distributed in the front to back direction and the width direction of the seat part **11**.

The conductor wires form the transmission lines of signals outputted from the pressure sensors **21**. The conductor wire is provided on each of the pressure sensors **21**. The conductor wire holding film **22** has a two-layer structure having a front layer and a back layer, and sandwiches and holds the pressure sensors **21** and the conductor wires between the layers. Note that the conductor wire holding film **22** is formed of a material having electrical conductiv-

ity, and made of polyethylene naphthalate, for example. The conductor wire holding film **22** has the thickness and flexibility to the extent that the conductor wire holding film **22** can be easily deformed.

The conductor wire holding film **22** has a portion extending along the front to back direction of the seat part **11** (in the following, a main portion **22***a*) and a portion extending from the main portion **22***a* to the position at which the pressure sensor **21** is disposed (in the following, a branch portion **22***b*). In the midway portion of the main portion **22***a*, a wide-width portion **22***c* in width wider than the width of the other portions is provided. The front end portion of this wide-width portion **22***c* has a tapered shape having the width tapered toward the front side.

The terminations of the conductor wires held on the conductor wire holding film **22** are connected to an ECU **70** (the ECU **70** will be described later) provided below the seat part **11**. In other words, the conductor wires and the conductor wire holding film **22** are disposed so as to penetrate the seat part **11** from the top surface of the pad material **11***b* to below the seat part **11**. In more specific description, the resin frame **11***a* and the pad material **11***b* are formed with a through hole. The conductor wires and the conductor wire holding film **22** are passed through this through hole, and thus disposed from the top surface of the pad material **11***b* toward below the seat part **11**.

Note that the through hole formed on the pad material **11***b* is inclined toward the vertical direction of the seat part **11** (in other words, the thickness direction of the pad material **11***b*). Specifically, the through hole is inclined toward the front side. In the through hole, the wide-width portion **22***c* of the main portion **22***a* of the conductor wire holding film **22** is disposed. Here, the through hole formed on the pad material **11***b* as described above is inclined toward the vertical direction of the seat part **11**, and hence this further increases the entire length of the through hole. Consequently, the wide-width portion **22***c* can be entirely housed in the through hole.

The configuration of the seat device **1** is again described. The seat device **1** has the awakening unit **60** shown in FIG. **5** and other drawings. In the following, referring to FIGS. **5** to **7**, the configuration of the awakening unit **60** will be described. FIG. **5** is a view of the awakening unit **60** when viewed from above. FIG. **6** is a view of the awakening unit **60** when viewed from below. FIG. **7** is an assembly diagram of the awakening unit **60**.

The awakening unit **60** has the outside shown in FIG. **5**, and is mounted below the seat part **11**. The awakening unit **60** is a mechanism that improves the wakefulness level of the seated person by imparting vibrations as a physical stimulus to the seated person. The specific configuration of the awakening unit **60** will be described. As shown in FIGS. **5**, **6**, and **7**, the awakening unit **60** has a vibration imparting device **62**, the ECU **70**, a battery **72**, and a holder **80**.

The vibration imparting device **62** corresponds to a moving device, and performs a vibration imparting operation in order to improve the wakefulness level of the seated person. The vibration imparting device **62** is formed of an unbalance mass type motor. As shown in FIG. **7**, the vibration imparting device **62** is composed of a motor **63** and a semi-columnar rotor **64** mounted on the rotating shaft of the motor **63**. The rotor **64** corresponds to a moving part. The vibration imparting device **62** performs the vibration imparting operation as the operation of moving the rotor **64**, and imparts a vibration stimulus to the seated person. In specific description, the motor **63** is activated to rotate the rotor **64**, and hence periodical vibrations of the seat part **11** are generated. These vibrations are transmitted to the seat part **11** through the holder **80** and a mounting bracket **90**, described later, and finally reached on the seated person seated on the seat part **11**.

The ECU **70** corresponds to a control mechanism, and controls the vibration imparting device **62**. In more specific description, the ECU **70** is formed of a control substrate, and connected to the termination portions of the conductor wires extending from the pressure sensors **21** through a termination terminal **71**. The ECU **70** receives a signal (i.e., the measurement result of the seating pressure) outputted from the pressure sensor **21**, and performs the process of operating the present wakefulness level of the seated person based on the signal. The ECU **70** controls the vibration imparting device **62** such that vibrations are generated at strength and a frequency corresponding to the operated wakefulness level. In other words, the ECU **70** controls the vibration imparting device **62** corresponding to the measurement result of the pressure sensor **21**.

In this connection, as a method of determining the wakefulness level of the seated person based on the measurement result of the seating pressure, a publicly known determination method can be used. For example, a waveform showing a periodic change in the seating pressure is identified from the measurement result of the pressure sensor **21**, and the wakefulness level of the seated person can be determined from the length of the period of the waveform (for easy understanding, intervals at which peaks appear in the waveform).

Note that as shown in FIG. **5**, the termination terminal **71** is provided on the front end portion of the ECU **70**. In other words, the termination portions of the conductor wires extending from the pressure sensors **21** are drawn from the front side of the ECU **70** toward the ECU **70**, and connected to the termination terminal **71**.

The battery **72** is a device that supplies electric power to the vibration imparting device **62** and the ECU **70**. Note that as shown in FIG. **7**, the battery **72** according to the embodiment has an outside shape in a nearly rectangular cuboid. The holder **80** is a container (a case) that holds the vibration imparting device **62**, the ECU **70**, and the battery **72**, and has an outside shown in FIG. **7**. In the following, the configuration of the holder **80** will be described in detail.

The holder **80** is a resin container shaped in a nearly boat shape, and has an opening on its top end. This opening reaches the front end upper portion of the holder **80**. On the lower portion of the bottom wall of the holder **80**, a battery housing space (not shown) is provided. The battery housing space is formed in a hollow on the under surface of the bottom wall in a nearly rectangular cuboid shape. The battery **72** is fit into this battery housing space, and the battery **72** is fixed to the bottom wall of the holder **80** with screws, for example. Thus, as shown in FIG. **6**, the battery **72** is held on the bottom wall of the holder **80**.

The holder **80** has a side wall **80***a* around the bottom wall. This side wall **80***a* is provided so as to surround the bottom wall of the holder **80**. As shown in FIG. **7**, the vibration imparting device **62** and the ECU **70** are held (housed) in the space surrounded by the side wall **80***a* and the bottom wall of the holder **80** (in the following, the internal space of the holder **80**). In specific description, in the region located on the rear side of the internal space of the holder **80**, a plurality of bosses **81** is provided. The boss **81** is provided in order to screw the ECU **70**. Four bosses **81** are provided at positions corresponding to the corner portions of the control substrate in a nearly rectangular shape forming the ECU **70**. As shown in FIG. **7**, the ECU **70** is housed in the rear part of the

internal space of the holder **80**, a screw is inserted into each of screw holes formed at the corner portions of the ECU **70**, and the screw is fastened to the boss **81**. Thus, the ECU **70** is held on the holder **80** being housed in the internal space of the holder **80**.

Note that as shown in FIG. **5**, in the internal space of the holder **80**, the ECU **70** is held above the portion protruding in a nearly rectangular cuboid shape that forms the above-described battery housing space in the bottom wall of the holder **80**.

In the internal space of the holder **80**, a motor holding part **82** is provided on the region located on the front side. This motor holding part **82** has a pair of vertical walls erected from the bottom wall and a pair of orthogonal walls provided orthogonal to the vertical walls. The motor **63** of the vibration imparting device **62** is fit into the lattice shaped space surrounded by the vertical walls and the orthogonal walls. After that, with the outer surface of the motor **63**, a presser plate **83** shown in FIG. **7** is engaged. The presser plate **83** is fixed to a predetermined portion of the holder **80** (strictly speaking, the portion protruding in a nearly rectangular cuboid shape that forms the above-described battery housing space in the bottom wall of the holder **80**). Thus, the vibration imparting device **62** is held on the motor holding part **82** with the vibration imparting device **62** including the motor **63** pressed against the motor holding part **82** by the presser plate **83**.

As described above, the holder **80** is configured to hold the vibration imparting device **62**, the ECU **70**, and the battery **72**. Thus, in the embodiment, the number of components (the number of the holders) is much smaller compared with the configuration in which the holders are provided individually to the above three devices.

As shown in FIGS. **3** and **4**, the awakening unit **60** described so far is mounted at the position below the front end portion of the seat part **11**. In more specific description, the holder **80** holding the vibration imparting device **62**, the ECU **70**, and the battery **72** is mounted on the lower frame **11***d* of the seat part **11** through the mounting bracket **90**. Thus, the awakening unit **60** is disposed at the position below the front end portion of the seat part **11**.

In the following, referring to FIGS. **8** to **12**, the mounting structure of the awakening unit **60** will be described. FIG. **8** is an illustration of a method of mounting the awakening unit **60** on the lower frame **11***d* of the seat part **11** using the mounting bracket **90**. FIGS. **9**A and **9**B are views showing the mounting bracket **90**. FIG. **9**A is a perspective view, and FIG. **9**B is a front view. FIG. **10** is a view of the awakening unit **60** mounted on the seat part **11** when viewed from above. Note that in FIG. **10**, for easily showing the mounting state of the awakening unit **60**, the components (specifically, the resin frame **11***a*, the pad material **11***b*, and the skin material **11***c*) located above the lower frame **11***d* of the seat part **11** are not shown. FIG. **11** is a cross-sectional view taken along line A-A in FIG. **10**. FIG. **12** is an enlarged view of the area around the mounting bracket **90** in FIG. **3**.

First, the configuration of the mounting bracket **90** will be described. The mounting bracket **90** is a plate-shaped member, and has an outside shown in FIGS. **9**A and **9**B. In the embodiment, the mounting bracket **90** is configured of a metal plate. However, the configuration is non-limiting to this. The mounting bracket **90** may be configured of a resin plate.

The mounting bracket **90** has a nearly rectangular shape when viewed from above. As shown in FIG. **8**, the mounting bracket **90** is fixed to the lower frame **11***d* of the seat device **1** with its long side direction being along the width direction of the seat part **11**. In specific description, in the center part of the mounting bracket **90** in the long side direction, a fixing hole **93** is formed. The fixing hole **93** corresponds to a plate-shaped member fixing part that is formed to fix the mounting bracket **90** to the seat part **11**. Into the fixing hole **93**, a bolt that is a fixing component is inserted, and the tip end portion of this bolt is fit into a bolt hole **11***e* formed on the lower frame **11***d*. Thus, the mounting bracket **90** is fixed to the under surface of the lower frame **11***d* (more strictly speaking, the under surface of the front end portion of the lower frame **11***d*).

As shown in FIGS. **8** and **9**A, at the two end portions of the mounting bracket **90** in the long side direction, a nail shaped mounting projection **91** is provided. The mounting projection **91** corresponds to a mounting part, and is a portion hanging down in a tongue shape from the edge portion of the end portion of the mounting bracket **90** in the long side direction. As shown in FIG. **8**, the mounting projection **91** extends along the vertical direction of the seat part **11** with the mounting bracket **90** fixed to the seat part **11**, strictly speaking, the mounting projection **91** protruding downward.

The side wall **80***a* of the holder **80** is mounted on the mounting projection **91**. In other words, the side wall **80***a* corresponds to a mounted part mounted on the mounting projection **91**. Note that as described later in the embodiment, the side wall **80***a* is mounted on the mounting projection **91** in a predetermined mounting direction.

As shown in FIGS. **8** and **9**A, in the embodiment, the mounting projection **91** are provided two each at the two end portions of the mounting bracket **90** in the long side direction. Here, the mounting projection **91** provided at one end portion of the mounting bracket **90** in the long side direction corresponds to a first mounting part, and is referred to as a first mounting projection **91***a* below. The mounting projection **91** provided at the other end portion of the mounting bracket **90** in the long side direction corresponds to a second mounting part, and is referred to as a second mounting projection **91***b* below.

As shown in FIG. **9**A, the first mounting projection **91***a* and the second mounting projection **91***b* are formed at positions apart from each other in the long side direction of the mounting bracket **90** (in other words, in the mounting direction, described later). The above-described fixing hole **93** is located between the first mounting projection **91***a* and the second mounting projection **91***b* in the long side direction of the mounting bracket **90** (in other words, in the mounting direction, described later). In other words, the fixing hole **93** is formed between the first mounting projection **91***a* and the second mounting projection **91***b* in the long side direction of the mounting bracket **90**. Thus, this enables easy avoidance of the situations of interference with the bolt inserted into the fixing hole **93** to fix the mounting bracket **90** to the seat part **11** in mounting the side wall **80***a* of the holder **80** on the mounting projection **91**.

The first mounting projection **91***a* and the second mounting projection **91***b* are provided two each as described above. That is, as shown in FIGS. **9**A and **9**B, the first mounting projection **91***a* is provided at two positions apart from each other in the short side direction of the mounting bracket **90**. Similarly, the second mounting projection **91***b* is also provided at two positions apart from each other in the short side direction of the mounting bracket **90**. The mounting projections **91** are individually formed with a through hole **91***h* for screwing.

As shown in FIGS. **8** and **9**A, a nail shaped engagement projection **92** is provided at one end portion of the mounting

bracket **90** in the short side direction (specifically, the end portion located on the front side with the mounting bracket **90** fixed to the seat part **11**). The engagement projection **92** corresponds to an engaging part, and is erected in a tongue shaped from the edge portion of one end portion of the mounting bracket **90** in the short side direction. As shown in FIG. **8**, the engagement projection **92** extends along the vertical direction of the seat part **11** with the mounting bracket **90** fixed to the seat part **11**, strictly speaking, the engagement projection **92** protruding upward.

As shown in FIG. **10**, the engagement projection **92** is engaged with the front end portion of the lower frame **11***d* of the seat part **11** with the mounting bracket **90** fixed to the seat part **11**. In other words, the engagement projection **92** is engaged with the lower frame **11***d* as the front to back direction of the seat part **11** (i.e., in the direction intersecting with the mounting direction, described later) is the engaging direction. The engagement projection **92** is thus engaged with the lower frame **11***d*, and hence prevents the mounting bracket **90** from rotating on the lower frame **11***d*. In other words, the engagement projection **92** functions as anti-rotation against the mounting bracket **90**. This function more stably fixes the mounting bracket **90** to the lower frame **11***d*.

Note that as shown in FIGS. **8** and **9**A, in the embodiment, the engagement projection **92** is formed at two positions apart from each other in the long side direction of the mounting bracket **90** (i.e., in the mounting direction, described later). One engagement projection **92** corresponds to a first engaging part, and is referred to as a first engagement projection **92***a* below. Another engagement projection **92** corresponds to a second engaging part, and is referred to as a second engagement projection **92***b* below.

As shown in FIGS. **8** and **9**A, a contact projection **94** in a nail shape is provided at the end portion on the opposite side where the engagement projection **92** is provided in the short side direction of the mounting bracket **90**. The contact projection **94** corresponds to a contact part, and is erected in a tongue shaped so as to face the engagement projection **92** in the short side direction of the mounting bracket **90**. As shown in FIG. **8**, the contact projection **94** extends along the vertical direction of the seat part **11** with the mounting bracket **90** fixed to the seat part **11**, strictly speaking, the contact projection **94** protruding upward. The amount of protrusion of the contact projection **94** is smaller than the amount of protrusion of the engagement projection **92** to some extent. In other words, the contact projection **94** is formed such that its top end is lower than the top end of the engagement projection **92**.

As shown in FIG. **12**, the contact projection **94** is in contact with the under surface of the lower frame **11***d* of the seat part **11** with the mounting bracket **90** fixed to the seat part **11**. The contact projection **94** is thus engaged with the under surface of the lower frame **11***d*, and hence the mounting bracket **90** is positioned to the lower frame **11***d*. In other words, the contact projection **94** functions as the positioning of the mounting bracket **90**. This function fixes the mounting bracket **90** being positioned at a predetermined fixing position in the vertical direction of the seat part **11**.

Note that as shown in FIGS. **8** and **9**A, in the embodiment, two contact projections **94** are provided such that the contact projection **94** corresponds to the engagement projection **92**. These two contact projections **94** are at positions apart from each other in the long side direction of the mounting bracket **90** (i.e., in the mounting direction, described later). One contact projection **94** corresponds to a first contact part, and is referred to as a first contact projection **94***a* below. Another contact projection **94** corresponds to a second contact part, and is referred to as a second contact projection **94***b* below.

Each of the contact projections **94** is provided at a position corresponding to each of the engagement projections **92** at the end portion of the mounting bracket **90** in the short side direction (at the end portion on the opposite side where the engagement projection **92** is provided). In specific description, the first contact projection **94***a* is provided at the same position at which the first engagement projection **92***a* is provided in the long side direction of the mounting bracket **90**. The second contact projection **94***b* is provided at the same position at which the second engagement projection **92***b* is provided in the long side direction of the mounting bracket **90**.

As shown in FIGS. **9**A and **9**B, the mounting bracket **90** is provided with a rib joining the engagement projection **92** to the contact projection **94**. In more specific description, between the first engagement projection **92***a* and the first contact projection **94***a*, a first joining rib **95***a* is provided extending so as to join the first engagement projection **92***a* to the first contact projection **94***a*. Between the second engagement projection **92***b* and the second contact projection **94***b*, a second joining rib **95***b* is provided extending so as to join the second engagement projection **92***b* to the second contact projection **94***b*. Both of the first joining rib **95***a* and the second joining rib **95***b* extend along the short side direction of the mounting bracket **90**, and their two end portions reach the corresponding engagement projection **92** and the corresponding contact projection **94**.

Referring to FIGS. **9**A and **9**B, the shapes of the first joining rib **95***a* and the second joining rib **95***b* will be described. The midway portions of the upper end surfaces of the joining ribs (the midway portions in the short side direction of the mounting bracket **90**) are one step lower than the other parts. Note that the portions other than the midway portions of the upper end surfaces of the ribs are at the same height as the height of the top end of the corresponding contact projection **94**, but slightly lower than the top end of the corresponding engagement projection **92**. Therefore, in the state in which the mounting bracket **90** is fixed to the seat part **11**, in the upper end surfaces of the joining ribs, the portions other than the midway portion that is one step lowered are in contact with the under surface of the lower frame **11***d* of the seat part **11** together with the contact projection **94**. Thus, the fixed state of the mounting bracket **90** can be more stabilized. In the mounting bracket **90**, the rigidity of the portions fixed to the lower frame **11***d* can be improved.

In this connection, in the embodiment, the under surface of the lower frame **11***d* has a curved surface gently curved in the front to back direction. In other words, in the embodiment, the top ends of the contact projection **94** and the joining ribs are in contact with the under surface of the lower frame **11***d* having the curved surface.

In the embodiment, the first joining rib **95***a* and the second joining rib **95***b* are components separate from the mounting bracket **90**, and are mounted on the mounting bracket **90** by welding, for example. However, the configuration is non-limiting to this. A configuration may be provided in which parts corresponding to the first joining rib **95***a* and the second joining rib **95***b* are formed as parts of the mounting bracket **90**, and the joining ribs are integrally shaped in shaping the mounting bracket **90**. For example, in processing and shaping the mounting bracket **90**, a bead (protrusion) may be provided at places where the first joining rib **95***a* and the second joining rib **95***b* are provided on the mounting bracket **90**, instead of the joining ribs.

Next, a configuration that mounts the awakening unit **60** on the seat part **11** using the above-described mounting bracket **90** will be described. In mounting the awakening unit **60**, the vibration imparting device **62**, the ECU **70**, and the battery **72** are held on the holder **80**. After that, the side wall **80***a* of the holder **80** is mounted on the mounting projection **91** of the mounting bracket **90** (more strictly speaking, the first mounting projection **91***a* and the second mounting projection **91***b*) with the mounting bracket **90** fixed to the front end portion of the lower frame **11***d* of the seat part **11**. Thus, the awakening unit **60** is mounted on the seat part **11** through the mounting bracket **90**.

As shown in FIG. **8**, in the embodiment, the direction in which the side wall **80***a* of the holder **80** is mounted on the mounting projection **91**, i.e., the mounting direction is along the width direction of the seat part **11**. In more specific description, the mounting bracket **90** is fixed to the lower frame **11***d* of the seat part **11** with the long side direction of the mounting bracket **90** being along the width direction of the seat part **11**. At the two end portions of the mounting bracket **90** in the long side direction, the mounting projections **91** protruding downward are provided.

As shown in FIG. **8**, the holder **80** holding the vibration imparting device **62**, the ECU **70**, and the battery **72** is brought close to the mounting bracket **90** from below the mounting bracket **90**. The holder **80** is then reached at the position at which the mounting bracket **90** is housed in the inside of the side wall **80***a*. In other words, the mounting bracket **90** is entered into the internal space of the holder **80**, and the mounting projections **91** are adjacent to the side wall **80***a* in the inside of the side wall **80***a* (strictly speaking, in the side wall **80***a*, the portion located at the end portion of the seat part **11** in the width direction). In other words, the mounting projections **91** are covered with the side wall **80***a* from the outer side of the seat part **11** in the width direction.

As shown in FIG. **7**, at the portion of the side wall **80***a* adjacent to the mounting projection **91**, a mounting hole **80***b* is formed. The mounting hole **80***b* is formed at a plurality of places corresponding to the number of the mounting projections **91** and the positions of the mounting projections **91** (specifically, four places). The mounting holes **80***b* communicate with the through holes **91***h* of the corresponding mounting projections **91** (specifically, the mounting projections **91** at the opposite positions). Into both of the mounting hole **80***b* and the through hole **91***h* communicating with each other, a tapping screw T that is a mounting component is inserted in the direction along the width direction of the seat part **11**. Thus, the side wall **80***a* of the holder **80** is mounted on the mounting projection **91**.

As described above, in the embodiment, the side wall **80***a* of the holder **80** is mounted on the mounting projections **91**, the mounting direction is along the width direction of the seat part **11**. With such a configuration, the holder **80** can be more easily mounted on the lower frame **11***d* of the seat part **11**. In more specific description, for example, in the case in which the holder **80** is directly mounted on the lower frame **11***d* with the tapping screw T, the tapping screw T is to be manipulated along the vertical direction of the seat part **11** (strictly speaking, the tapping screw T is directed upward). In contrast to this, in the embodiment, the tapping screw T is manipulated from the lateral side (i.e., along the width direction of the seat part **11**), and hence the manipulation of the screw becomes more easily. Consequently, the awakening unit **60** including the holder **80** is more easily mounted on the lower frame **11***d*.

In the state in which the side wall **80***a* of the holder **80** is mounted on the mounting projection **91**, the mounting bracket **90** is located in the holder **80**. In other words, as shown in FIG. **10**, the mounting projection **91** is covered with the side wall **80***a* of the holder **80** in the width direction of the seat part **11** (i.e., in the mounting direction). As described above, in the embodiment, the side wall **80***a* eliminates the exposure of the mounting projection **91** with the awakening unit **60** mounted on the seat part **11**. Thus, the outside of the seat device **1** including the awakening unit **60** can be made excellent. More specifically, the event that the mounting projection **91** is seen from the lateral side can be avoided.

The front end portion of the seat part **11** has the overhang portion lit overhanging downward. As shown in FIG. **4**, the overhang portion lit is located on the front side of the front end of the holder **80** with the side wall **80***a* of the holder **80** mounted on the mounting projection **91**. In this state, the overhang portion lit covers at least a part of the front end of the holder **80** in the front to back direction of the seat part **11**. In more specific description, the overhang portion lit covers the opening reaching the upper portion of the front end of the holder **80**. Thus, the front end portion of the holder **80** (specifically, the portion near the opening) is protected by the cover of the overhang portion lit.

Other Embodiments

The configuration of the seat device according to the present invention is described so far taking an example. However, the above-described embodiment is provided for easily understanding the present invention, and does not limit the present invention. That is, of course, the present invention can be modified and altered without deviating from its gist, and the present invention includes the equivalents of modifications and alterations.

In the foregoing embodiment, the vibration imparting device **62** that improves the wakefulness level of the seated person is used as a moving device. However, the configuration is non-limiting to this. Devices that improve the wakefulness level of the seated person by a stimulus other than vibrations can also be used, such as a device that generates (reproduces) sound, for example. The application of the moving device is not limited to awakening. The moving device may be used for other applications, specifically, the applications that adjust the state of the seated person (e.g. tension level) other than the wakefulness level.

In the foregoing embodiment, the side wall **80***a* of the holder **80** is mounted on the mounting projection **91** of the mounting bracket **90** with the tapping screw T, and the mounting direction (the screw manipulation direction) is along the width direction of the seat part **11**. However, the configuration is non-limiting to this. The mounting direction may be along the front to back direction of the seat part **11**. That is, a configuration may be provided in which the mounting projection **91** is provided at the front end or the rear end of the edge portion of the mounting bracket **90** and the tapping screw T is manipulated along the front to back direction of the seat part **11** in mounting the side wall **80***a* of the holder **80** on the mounting projection **91**.

In the foregoing embodiment, the tapping screw T is used as a component that mounts the holder **80** on the mounting bracket **90**. However, the configuration is non-limiting to this. A structure may be adopted in which the holder **80** can be mounted on the mounting bracket **90** with a component other than the tapping screw T. For example, a snap-fit structure or a fitting structure using projections and depressions maybe adopted. In the case in which such a mounting

structure is adopted, the holder **80** may be mounted on the mounting bracket **90** in the vertical direction of the seat part **11**.

REFERENCE SIGNS LIST

1: Seat device
10: Chair main body
11: Seat part
11*a*: Resin frame
11*b*: Pad material
11*c*: Skin material
11*d*: Lower frame (frame)
11*e*: Bolt hole
11*t*: Overhang portion (portion overhanging downward)
12: Backrest portion
13: Support post
14: Leg part
20: Respiration sensor unit
21: Pressure sensor (sensor)
22: Conductor wire holding film
22*a*: Main portion
22*b*: Branch portion
22*c*: Wide-width portion
60: Awakening unit
62: Vibration imparting device (moving device)
63: Motor
64: Rotor (moving part)
70: ECU (control mechanism)
71: Termination terminal
72: Battery
80: Holder
80*a*: Side wall (mounted part, including first mounted part and second mounted part)
80*b*: Mounting hole
81: Boss
82: Motor holding part
83: Presser plate
90: Mounting bracket (plate-shaped member)
91: Mounting projection (mounting part)
91*a*: First mounting projection (first mounting part)
91*b*: Second mounting projection (second mounting part)
91*h*: Through hole
92: Engagement projection (engaging part)
92*a*: First engagement projection (first engaging part)
92*b*: Second engagement projection (second engaging part)
93: Fixing hole (plate-shaped member fixing part)
94: Contact projection (contact part)
94*a*: First contact projection (first contact part)
94*b*: Second contact projection (second contact part)
95*a*: First joining rib
95*b*: Second joining rib
T: Tapping screw

The invention claimed is:

1. A seat device comprising:
a seat part on which a seated person is seated;
a sensor configured to measure a measurement value relating to a state of the seated person seated on the seat part;
a moving device having a moving part, the moving device being configured to perform an operation of moving the moving part;
a controller configured to control the operation of the moving device corresponding to a measurement result of the sensor;
a holder holding the controller; and
a plate-shaped member fixed to the seat part such that the holder is mounted on the seat part, wherein
the plate-shaped member includes a mounting part on which a mounted part of the holder is mounted in a predetermined mounting direction,
in a state in which the mounted part is mounted on the mounting part, the mounting part is covered with the mounted part in the mounting direction,
a lower portion of the seat part has a frame,
the plate-shaped member has an engaging part engaged with an edge portion of the frame with the plate-shaped member fixed to the seat part, and
the engaging part is engaged with the edge portion of the frame in an engaging direction intersecting with the mounting direction.

2. The seat device according to claim **1**, wherein
the mounting part has a first mounting part and a second mounting part formed at positions apart from each other in the mounting direction,
the plate-shaped member has a plate-shaped member fixing part formed such that the plate shaped member is fixed to the seat part, and
the plate-shaped member fixing part is formed between the first mounting part and the second mounting part in the mounting direction.

3. The seat device according to claim **1**, wherein
the engaging part has a first engaging part and a second engaging part formed at positions apart from each other in the mounting direction,
the plate-shaped member has a contact part in contact with an under surface of the frame with the plate-shaped member fixed to the seat part,
the contact part has a first contact part and a second contact part formed at positions apart from each other in the mounting direction, and
a first joining rib extending so as to join the first engaging part to the first contact part and a second joining rib extending so as to join the second engaging part to the second contact part are provided on the plate-shaped member.

4. The seat device according to claim **1**, wherein
a front end portion of the seat part has a portion overhanging downward, and
in the front end portion of the seat part, the portion overhanging downward is located on a front side of a front end of the holder, and the portion overhanging downward covers at least a part of the front end of the holder in a front to back direction of the seat part.

5. The seat device according to claim **1**, wherein
the mounting direction is a direction along a front to back direction of the seat part or along a width direction of the seat part, and
the mounting part protrudes along a vertical direction of the seat part with the plate-shaped member fixed to the seat part.

6. The seat device according to claim **1**, comprising a battery configured to supply electric power to the moving device, wherein
the holder holds the moving device and the battery together with the controller.

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